

PTO 08-0815

CC=JP  
DATE=19910605  
KIND=A  
PN=03131677

POLYSTYRENE-BASED TACKY TAPE AND PRODUCTION THEREOF  
[Porisuchiren-kei Nenchaku Tepu oyobi Sono Seizo Hoho]

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UNITED STATES PATENT AND TRADEMARK OFFICE  
WASHINGTON, D.C. November 2007  
TRANSLATED BY: SCHREIBER TRANSLATION, INC.

PUBLICATION COUNTRY (10) : JA

DOCUMENT NUMBER (11) : 03131677

DOCUMENT KIND (12) : A

PUBLICATION DATE (43) : 19910605

APPLICATION NUMBER (21) : 01269069

APPLICATION DATE (22) : 19891018

INTERNATIONAL CLASSIFICATION (51) : C 09 J 7/02  
B 05 D 7/04  
C 09 J 7/02

JAPAN CLASSIFICATION (52) : N/A

PRIORITY COUNTRY (33) : N/A

PRIORITY NUMBER (31) : N/A

PRIORITY DATE (32) : N/A

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DESIGNATED CONTRACTING STATES (81) : N/A

TITLE (54) : POLYSTYRENE-BASED TACKY  
TAPE AND PRODUCTION  
THEREOF

FOREIGN TITLE (54A) : Porisuchiren-kei Nenchaku  
Tepu oyobi Sono Seizo Hoho

SPECIFICATION

I. Title of the Invention

Polystyrene-Based Tacky Tape and Production Thereof

II. Claims

1. A polystyrene-based tacky tape and production thereof which is characterized by comprising three layers of a curable-type silicone release agent layer, a polystyrene film layer and an acrylic tacky agent layer.

2. A production method of polystyrene-based tacky tape which is characterized by coating a curable-type silicone release agent dispersed in one selected from hexane, heptane or their mixture on one side of a polystyrene film, immediately drying it and coating an acrylic tacky agent on the other side.

III. Detailed Description of the Invention

[Field of Industrial Application]

The present invention relates to a polystyrene-based tacky

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<sup>1</sup>Numbers in the margin indicate pagination in the foreign text.

tape and a production method thereof suited to the sealing of expanded polystyrene boxes.

[Prior Art]

Recently, a demand for storage and transportation boxes of perishable food products and living flowers, etc. by use of excellent adiabatic property of expanded polystyrene has been increased.

In expanded polystyrene boxes, a cover and a main body are made separately, and a paper or polypropylene tacky tape is used to fix the cover to the main body in use.

[Problem to Be Solved by the Invention]

Reclaiming utilization of expanded polystyrene has been investigated because its burning treatment is difficult.

However, if a tacky tape made of paper or polypropylene used for sealing is mixed into in a reclaiming process, paper and polypropylene affect properties of polystyrene as impurities because they do not have compatibility with polystyrene and have such a problem that a good-quality reclaimed polystyrene cannot be obtained. Therefore, tacky tapes used for sealing must totally removed from the expanded polystyrene boxes to reclaim a good-quality polystyrene and the operation becomes complicated.

Moreover, the polypropylene tacky tape cannot be cut by hand, therefore scissors or tape cutters must be used and the operating efficiency is bad.

The object of present invention consists in providing a tacky tape that does not make troubles in reclamation of expanded polystyrene boxes and has excellent sealing operability.

[Means for Solving the Problem and Functions]

The inventor made earnest studies to solve the above problem, consequently he accomplished the present invention as a means for achieving the above object, first, the present invention provides a polystyrene-based tacky tape comprising three layers of a curable-type silicone release agent layer, a polystyrene film layer and an acrylic tacky agent layer; secondly, the present invention provides a production method of the polystyrene-based tacky tape wherein a curable-type silicone release agent dispersed in one selected from hexane, heptane or their mixture is coated on one side of a polystyrene film, immediately dried and then an acrylic tacky agent is coated on the other side.

The present invention is described in detail below.

Polystyrene-based films are films of polystyrene, polystyrene copolymers such as butadiene-styrene copolymer,

styrene-acrylonitrile copolymer, etc. and mixtures of polystyrene and these copolymers, preferably stretched films.

When the stretch ratio in the cross direction of a stretched film is taken as  $\lambda T_0$  and the stretch ratio in the longitudinal direction as  $\lambda M_0$ , if  $2 \leq \lambda T_0 < \lambda M_0$ , it is very preferable because polystyrene film has improved brittleness and tensile strength and is excellent in tear strength in the cross direction necessary for a tape.

Next, the curable-type silicone release agent is preferably given by mixing and dispersing addition-type silicone, platinum catalyst and acetylene curing retardant in a solvent.

In the present invention, a solution given by mixing and dispersing the above curable-type silicone release agent in a solvent selected from hexane, heptane or their mixture is coated on the polystyrene film.

If the silicone release agent was coated on the polystyrene film, a tacky tape of polystyrene film could not be produced before because the polystyrene film was dissolved by solvents, e.g., xylene or toluene, etc. for dispersing the release agent. The present invention enables to produce a polystyrene-based tacky tape by selecting solvents that exert less effect on polystyrene and further drying it instantly after coating.

In the present invention, the solvents must be removed (dried) immediately after the release agent was coated on a film, preferably within 3 sec. The solvent removal is completed at a time of curing the silicone as release agent to a sufficient level.

In the present invention, the amount of components mixed and dispersed in a solvent is preferably 3 ~ 7 pt (abbreviation of "part by weight", translator) of a platinum-based catalyst, 6 ~ 14 pt of an acetylene curing retardant and 500 ~ 1,500 pt of a solvent.

The coating weight of release agent is preferably 50 mg/m<sup>2</sup> ~ 2 g/m<sup>2</sup>. If the release agent is less than 50 mg/m<sup>2</sup>, this is undesirable because it has such problems that the backside releasability of tacky film deteriorates and a cut tacky tape curls and becomes hard to handle. If the release agent is more than 2 g/m<sup>2</sup>, the effect does not change, therefore a coating weight of more than 2 g/m<sup>2</sup> is unnecessary from a viewpoint of economy.

40 ~ 65 wt% of emulsion-type acrylic tacky agents is preferably used in the present invention. For example, EMPS-30, EMPS-40 made by Cemedine Co., Ltd. are given. The coating weight onto the polystyrene film is 5 g/m<sup>2</sup> or more. If it is less than 5

g/m<sup>2</sup>, this is undesirable because the tack strength is insufficient.

If the above production conditions are satisfied, specific production methods of the polystyrene-based tacky tape of present invention are not especially restricted, preferably, a release agent is coated while moving the polystyrene film at a constant speed and simultaneously dried by a drying machine under a temperature condition of 80°C for 2 sec.

The polystyrene-based tacky tape of the present invention can be easily cut off by hand and is excellent in printability, transparency and gloss. Even if the polystyrene-based tacky tape is used for sealing of expanded polystyrene boxes, the tape is

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easily reclaimed without peeling as it is because they are same material.

#### [Actual Examples]

Actual examples of the present invention are shown below, but the present invention is not limited by these example. All of [pt] in the actual examples are parts by weight.

#### [Actual Example 1]

2 g/m<sup>2</sup> of a mixed solution of 100 pt of a silicone, 1,200 pt of heptane, 5 pt of a catalyst and 9 pt of a retardant was coated on one side of a 30 µm-thick stretched polystyrene film

with a stretch ratio of  $\lambda T_0 = 2$  and  $\lambda M_0 = 6$  (Styrofilm<sup>®</sup> made by Asahi Chemical Industry Co., Ltd.) by a gravure-type printing machine while moving at a speed of 50 m/min, the solvent was removed by passing through a hot air drying machine (1.5 m in length) and then the silicone was cured. A time taken from coating of release agent to removal of solvent was about 1.8 sec. 20 g/m<sup>2</sup> of a 50 wt% acrylic emulsion-type tacky agent was coated on the reverse side of film and moisture was removed. It was slit and wound on a 200 m paper tube in a width of 50 mm.

The tacky tape of this actual example could be simply cut by hand.

The expanded polystyrene boxes sealed by the tacky tape of this actual example were crushed, pelletized and the reclaimed polystyrene film was molded by inflation method, it had good transparency and almost no difference in strength from a molded film from expanded polystyrene boxes only.

[Actual Example 2]

A tacky tape was trially made in the same way as Actual Example 1 except that 1,200 pt of heptane was changed to 900 pt of hexane. The result was as good as Actual Example 1.

[Actual Example 3]

A tacky tape was trially made in the same way as Actual Example 1 except that 1,200 pt of heptane was changed to 600 pt

of hexane and 400 pt of heptane. The result was as good as Actual Example 1.

[Actual Example 4]

A tacky tape was trially made in the same way as Actual Example 1 except that the stretched polystyrene film of Actual Example 1 was changed to a styrene-butadiene copolymer film. The result was as good as Actual Example 1.

[Comparative Example 1]

A reclaimed polystyrene film was similarly molded as Actual Example 1 by using the expanded polystyrene boxes sealed by a tacky tape made of polypropylene, but the film was bad in transparency, weak in strength and could not be used as polystyrene film.

[Comparative Example 2]

A mixed solution of silicone in which heptane of Actual Example 1 was changed to xylene was coated, but a stretch polystyrene film was cut off during coating and a tacky tape could not be trially made.

[Effects of the Invention]

As described above, when the polystyrene tacky tape of the present invention was used for sealing of expanded polystyrene boxes, the tape can be reclaimed as it is without peeling, easier cut than the prior polypropylene tacky tape and can markedly

enhance the operability of sealing and reclamation of the expanded polystyrene boxes.

Moreover, a tacky tape with high decorativeness can be produced by use of excellent properties such as printability, transparency and gloss and widely used as a tacky tape not only for expanded polystyrene boxes but also for other packaging.